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Gas Journal

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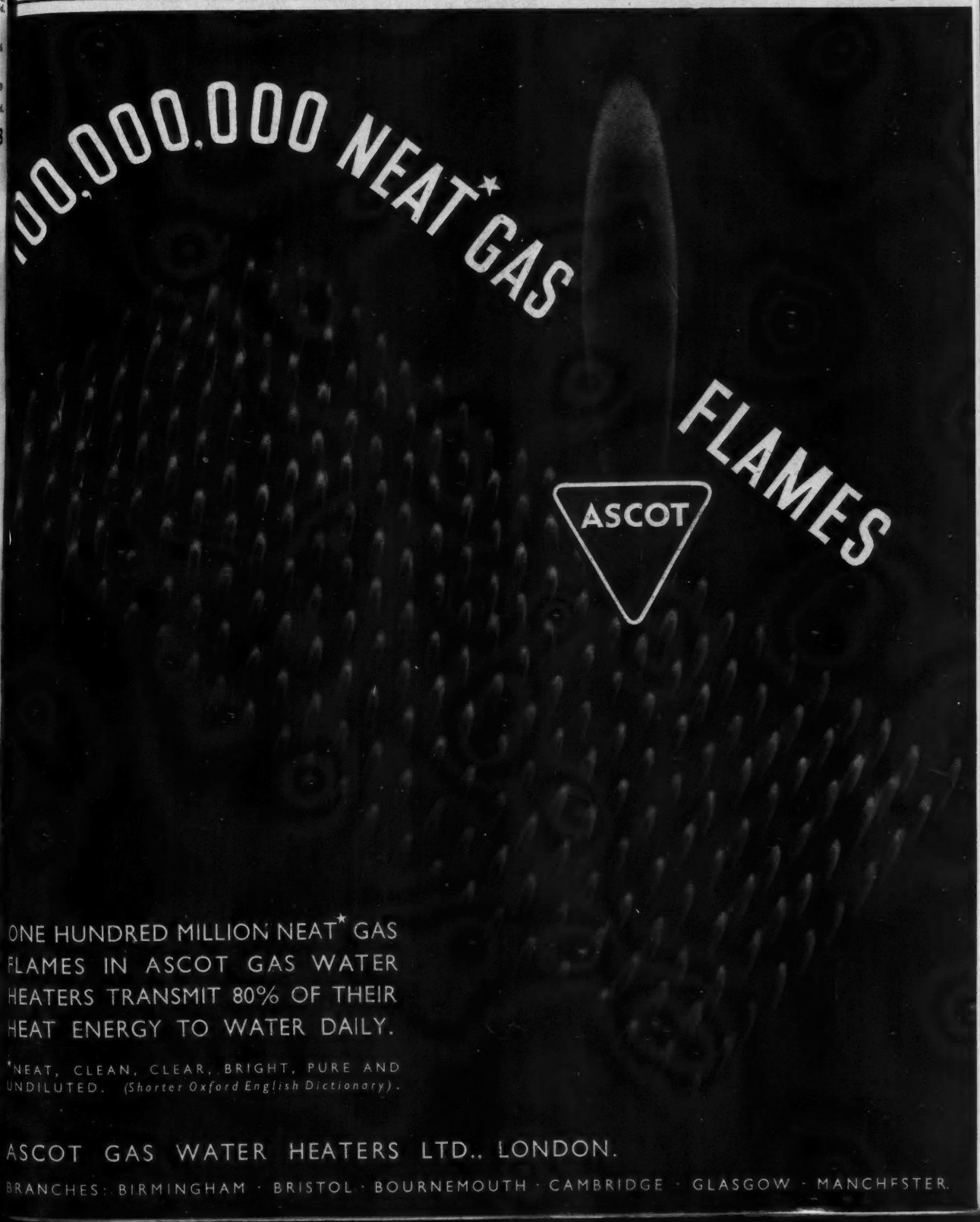
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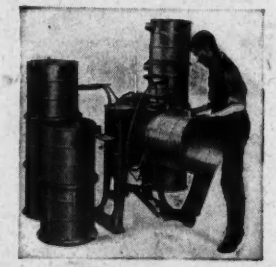

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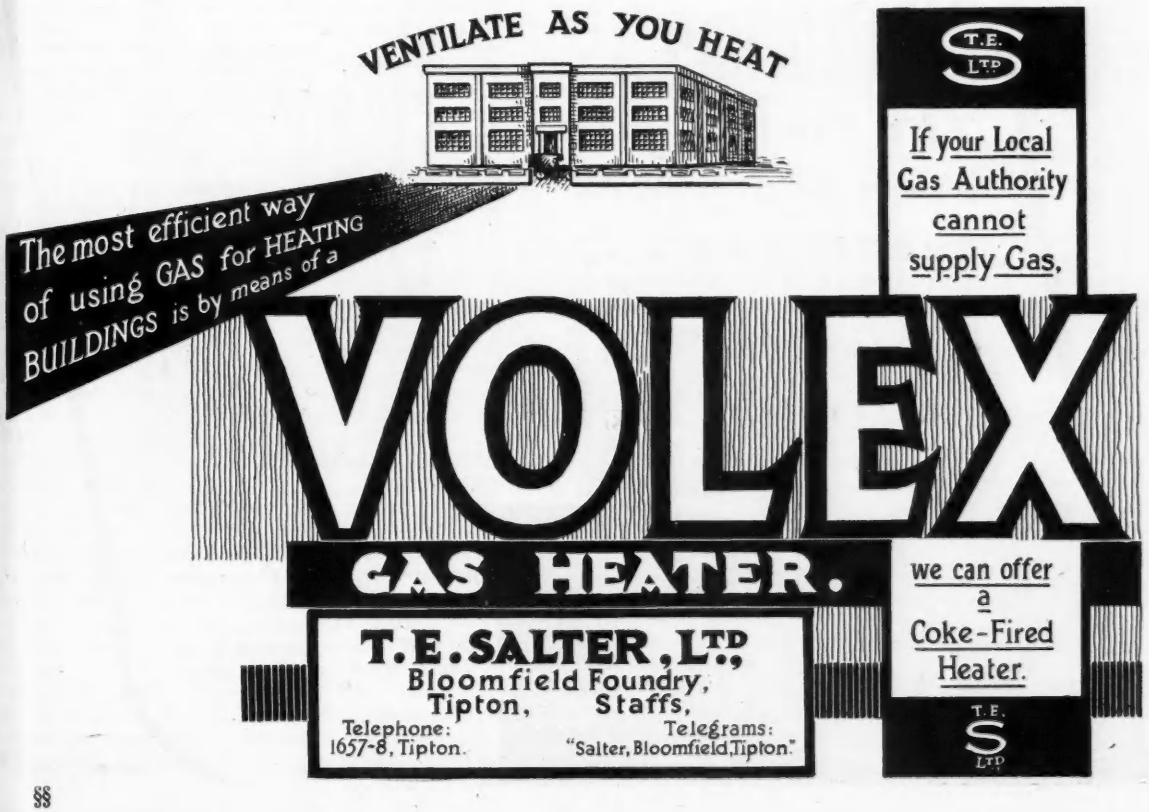
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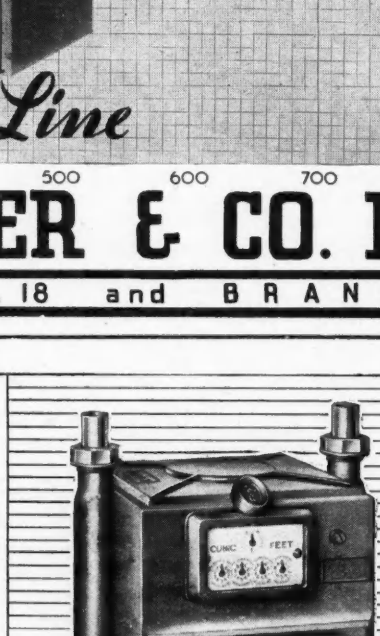

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GAS JOURNAL, AUG. 11, 1943
VOL. 242 95th YEAR No. 4186

EDITORIAL NOTES

DISTRICT HEATING

IN the numerous and widespread discussions which are taking place regarding the planning of future homes offering more amenities than in the past, considerable thought is being given to district heating by steam and hot water and rosy pictures are being painted of the possibilities of the system in general—too frequently, we think, without proper appreciation of the complex problems involved and the capital cost entailed. Perhaps the comparative novelty of the system as far as this country is concerned is responsible for over-optimism concerning its application; and we would add that it is not sufficient technical argument to point to what America or Russia has achieved in this direction, and then to suggest that we should follow it up in the grand manner here. For steam costs money, and the application of "waste" steam costs money—a good deal of money when one considers district heating on anything but a limited scale. The large-scale district heating we have in mind includes the supply of steam to industrial and commercial as well as domestic premises, such, for example, as practised in Pittsburg or Chicago. Small-scale application comes into quite a different category. A large block of flats may for the purpose be considered as a district, and there are several such districts supplied with hot water for heating purposes from a central source—a central installation fired by coke. We call to mind Europe's largest block of flats, situated in London, and described rightly or wrongly as one of the greatest building enterprises of this century, which has its central heating and hot water provided by coke. We could instance many other "district" heating installations, fired by coke, perhaps not quite so impressive in terms of capacity, but certainly equally impressive in terms of the heat service given; and the experience gained has shown that it by no means follows that the larger the installation the lower the cost of steam—*i.e.*, heat service—to the individual consumer.

We have emphasized that steam costs money, and we think that the effective utilization even of otherwise "waste" steam is a more formidable economic proposition than some non-technical enthusiasts imagine. And we say this in no way desiring on principle to disparage district heating; our aim must obviously be to use coal to the best all-round advantage. But we must also have regard to facts. That is why we were pleased to publish last week (*ante*, p. 135) an article on the subject by Mr. J. E. Davis which, it seems to us, brings to bear on it a sense of proportion, and to which technically balanced view we should like to draw attention. This question of cost. It is confirmed in practice that the cost of producing a therm in steam is approximately equal to the cost of producing a therm of gas (incidentally this is why, as we have stressed more than once recently, steam must not be used extravagantly on gas-works). Secondly, the distribution of heat in steam is much more costly than the distribution of the equivalent amount of heat as gas. The heat content of a cubic foot of steam is about one-tenth the heat content of a cubic foot of gas (*circa* 500 B.Th.U. per cu.ft.) at the same pressure. Heat losses in the distribution of steam are appreciable. From articles published in the *Steam Engineer* between May, 1937, and January, 1938, we gather that losses assessed as a percentage of steam sendout on an actual system amounted to between 11 and 15, but that in many cases the yearly overall system efficiency is as low as 75%. Mr. Davis puts forward the view that for a residential district of separate houses the transmission losses might well amount to 40 or 50%. He adds that with coal at 25s. a ton, the cost of steam to a consumer in a densely built-up area is not likely to be less than 4d. a therm, and in a residential area is likely to exceed 6d. a therm (a figure of 7d. a therm, we think, is not far wide of the mark). The point we would make is that "district" steam is not a cheap proposition.

So far we have, in giving this figure of, say, 6d. or 7d. a therm for district steam, been concerned with schemes not associated with electricity generation. The question arises, Should the plant be designed solely for the generation of steam for sale, or should the steam generated be first passed through turbines and then exhausted from these to the distribution system? And we quote from one of the articles in the *Steam Engineer* (*loc. cit.*): "The usual answer to the question of the economy of securing electric energy before delivering the steam to the distribution system is No." The article, by the way, was written by an American authority on the subject. Well, suppose we are using steam primarily for the production of electricity, does it not stand to reason that the steam, if employed for district heating, would be cheap—and would not its use reflect favourably on the thermal efficiency of electricity generation? Such a question has been and is being raised. When one comes to examine the facts, there is no place for a facile answer, and we would reiterate that the application of waste heat steam costs a great deal of money. We turn to the admirable article by Mr. Davis. From electricity generating stations the heat is rejected at too low a temperature to be of any value for a district heating scheme. And, of course, increasing the temperature of reject from a generating station would decrease the thermal efficiency of electricity generation. Shall we, then, regard the combination as a district heating scheme in which steam is generated at a pressure higher than that necessary for distribution and expanded to the initial distribution pressure, generating electricity *en passant*? Electricity would then be able to share the capital cost of steam-raising plant with the district heating scheme. But—an important "but"—electricity would, as Mr. Davis said, lose any opportunity of selling off-peak current for low potential heat requirements, for these would be met by the steam district heating scheme. The possibility of improving the electrical load factor is therefore reduced and the average cost of electrical energy might well be increased. Perhaps the "usual answer," quoted above, No, is right. At any rate experience in America has been marked by a tendency for electricity generation and district heating to be operated as separate undertakings and for schemes originally combined to become separated. The Gas Industry should have, and no doubt has, knowledge of the implication of district heating and of the main considerations involved. From the national aspect of the whole question—the best use of our coal resources—we hope that these considerations will be given their proper balance and perspective in plans for an interlinked and broad fuel policy in the post-war era.

FACTS FOUND

APART from a few minor mopping-up—or, rather, mapping-out—operations the work of the Gas Industry's fact-finding sub-committee set up under the leadership of Mr. A. E. Sylvester five months ago has come to a close. A factual report of this intensive survey of the Industry carried out with thoroughness by a fine comb has been prepared and is being submitted to the Post-War Planning Committee and the British Gas Federation. It should be extremely helpful. From the start we thought this survey was being tackled on the right lines and we have followed its progress with the keenest of interest, appreciating its great potential value. Information of a vital nature has been collated with wholly admirable dispatch and the story has been gradually unfolded diagrammatically area by area; and now we have a map-picture of gas supply throughout Great

Britain—a picture of the most revealing kind which speaks for itself and prompts a hundred and one pertinent questions which, for the future welfare of the Industry, call for reply. The many responsible gas executives who, like ourselves, have had the opportunity of following the progress of this survey will, we are sure, agree with us as to its value in planning for a better and more rational gas service throughout the land.

Such obviously relevant information as density of gas demand, ownership and size of undertakings, availability of coke oven gas, and so on, has been plotted geographically district by district with results which demand explanation; the tell-tale maps are full of suggestion. Naturally at the outset everything depended on the response by individual gas undertakings to the requests for information. In the event the response has been excellent and has made possible this accurate and vivid presentation of facts. Achievements in manufacture, in amalgamation, by whatever form and both company and municipal, in bulk supply, in utilization of coke oven gas have been set out graphically, and, it seems to us, they stand out clearly as pointers to future development. Incidentally there is the reverse picture of what has not been accomplished, again a clear, if a somewhat disturbing, picture. The drawings and the writing are on the wall.

As was to be expected, the work has brought into conspicuous relief the very real differences between quite well defined areas of supply. Between the various districts the public's demands regarding gas service markedly vary; for example, conditions in or near the coalfields by no means obtain in or around London, and to cope with them satisfactorily calls for special treatment. But this in no way explains away the weird divergences in the service offered to the consumer by individual gas undertakings in any given area. The urgent need for area co-operation stands out a mile; and once again we see the over-emphasis given so commonly in the past to the production side as distinct from the service side of the Gas Industry's activities. And we also see the cleavage which exists between conditions of gas supply in England and those in Scotland as regards statutory and non-statutory undertakings. So we could go on, but this is merely indicative of the suggestive nature of this visual presentation of hard facts.

The survey has been carried out in the cold light of objectivity. In our view the way in which the work has been undertaken should stand as example to further statistical recording, and not only just the recording of facts but the visual interpretation of load potentialities. But the simple purpose of the Sylvester sub-committee was to get the facts, and it has got them. Equipped with more basic data, the Gas Industry should be better able to formulate its future plans. As we have said, the facts presented call for answer and explanation. Above all, they provide certain clear pointers for the Gas Industry in the action which it is being called upon to take—action which cannot be indefinitely delayed.

Personal

Mr. W. D. KING, a Director of Richmonds Gas Stove Company, Ltd., has also joined the Board of Fletcher Russell & Company, Ltd., and succeeds the late C. G. Langford as General Manager at Warrington, Lancs.

* * *

Mr. WILLIAM HODKINSON, for seven years principal assistant to the Managing Director of the United Kingdom Gas Corporation, has been appointed General Manager of the Corporation.

Letters to the Editor

Submerged Combustion

DEAR SIR,—Your Editorial comment on this development has aroused considerable interest, and the hint of actual experiences to follow is an anticipated pleasure. Meanwhile, a backward glance may prove profitable.

At the 1905 Gas Exhibition at Earl's Court 38 years ago there was displayed this intriguing principle of submerged combustion, and great were the expectations of its rapid development because of its high thermal efficiency. From memory the exhibit took the form of a clear glass bowl some 3 ft. in diameter and 3 ft. deep, filled with water, and a huge flame burned from the submerged simple pipe end and maintained the water in rapid ebullition—the whole exhibit being ideal, for it attracted universal attention. To-day the new submerged burners yielding virtually 100% efficiency for water heating inspire the hope that they will eventually prove adaptable for 100% efficient steam raising *by gas* in simple forms of boiler.

Hampton, Middlesex. Yours faithfully,
August 6, 1943. H. J. TOOGOOD.

Unkind

DEAR SIR,—It is to be hoped that the following extract of titles, in time sequence, on a recent radio programme is not typical of the way the Industry is regarded:

9.35 p.m. Play entitled "Gaslight."
10.35 p.m. "Lighten our Darkness."

Yours faithfully,
July 31, 1943. N. H. D.

Ministry of Fuel and Power Announcement

While the housewife is striving to economize in the use of gas, and industrial firms are closely watching their gas consumption, the Gas Industry itself is making a renewed effort to save fuel. Demands for gas have gone up by leaps and bounds as the production of munitions has risen. This, and other wartime conditions, have made it difficult for the Gas Industry to maintain the full efficiency of its operations. Changes in the types of coal supplied have called for alterations in gas-making practice, and, apart from difficulties of maintenance, the great labour shortage has had serious effects.

None the less, at a meeting between the Fuel Efficiency Committee of the Ministry of Fuel and Power and the Co-ordinating Committee of the Gas Engineering Advisory Board that has just taken place, it was announced that the Industry had set itself a target for economizing an additional 200,000 tons of coal in the next year. This is a larger percentage of the total used at gas-works than might at first be imagined. For every 100 tons of coal received at the gas-works, the equivalent of about 75 passes out again to consumers in the form of coke and gas. Thus, the whole economy must be achieved by savings in the 25 tons out of every 100 used to make gas and coke, and the economy target of 200,000 tons represents approximately 4% of the total coal used.

The Regional Gas Advisory Boards are setting up a "mutual help" scheme to improve efficiency, and to ensure that supplies to the consumer are maintained. This idea originated in the Birmingham area, where engineers from the larger undertakings "adopted" some smaller ones nearby. They made regular visits to give technical advice and assisted wherever possible with loans of equipment, and even labour. A travelling laboratory was fitted in a caravan body to tour the undertakings who lacked chemical assistants. Without these arrangements the supplies of gas to munition works in this vital area might have been interrupted on many occasions.

This same organization is now being extended to other districts of the country, and used for the economy campaign. Estimates have been made, for every undertaking, of the proportion of the total coal that is used to make the rest into gas and coke, and it is the object of each undertaking to reduce this proportion as much as possible. Encouraging reports have already been received from some districts of the savings that can be made through this pooling of technical knowledge in the national interest.

In addition to putting its own house in order, the Gas Industry has been giving invaluable assistance to industry through the Industrial Gas Centres. These Centres were set up throughout the country to provide the services of gas engineers for dealing with industry's problems with gas-fired furnaces and other equipment, and they have worked in close co-operation with the Regional Fuel Efficiency Committees of the Ministry of Fuel and Power.

Dr. Grumell, Chairman of the Fuel Efficiency Committee, thanked Mr. E. V. Evans and the Co-ordinating Committee of the Gas Engineering Advisory Board for attending the meeting. He stressed the seriousness of the coal situation, and the need for speedy progress in securing greater fuel efficiency. He said it was clear that, as a result of this meeting, the Gas Industry would be encouraged to achieve further substantial savings in fuel.

Manchester Association

Members of the Manchester District Association of Gas Engineers visited Liverpool on July 30 to celebrate the President's Day, 1943, and inspected the Garston Works of the Liverpool Gas Company.

They met at the Midland Adelphi Hotel, Liverpool, where they were the guests of the Chairman, Lieut.-Col. Albert Buckley, D.S.O., J.P., and Directors of the Liverpool Gas Company at luncheon.

After the Loyal Toast, proposed by the President, Mr. WM. FLETCHER, Mr. C. H. LEACH, General Manager and Secretary of the Liverpool Gas Company, gave "The Manchester District Association of Gas Engineers," and said that although the Manchester Association was formed many years ago, he ventured to suggest that at no time in its history had it had a better opportunity of living up to its ideals than

at the present moment. With all the changes that had taken place, technical, administrative, and so on, he felt the present was a time for their Association to do some of its finest work. He coupled with the toast the name of the President, Mr. William Fletcher.

Mr. FLETCHER, responding, said that regarding labour there was no doubt that the Industry was faced with difficult times ahead. It was generally agreed that labour would not in the future be prepared to perform some of the arduous tasks which it had done in the past. Of course the present conditions were extremely unpleasant, due mainly to the lack of ventilation through the blackout. Although they had endeavoured to improve those matters, they were still far from what they would desire. Another contributory cause of bad working conditions was the wide variation in the class of coal they were now called upon to carbonize. He suggested that in dealing with the improvement of facilities for the workmen under post-war conditions more attention should be given to adequate ventilation by bringing fresh air into the place at one end, and at the other end more efficient extraction of the smoke and dirt which to some extent was unavoidable. Again, they might take lessons from the collieries in respect of the provision of shower-baths, &c. In regard to purification, all possible labour-saving appliances which it was possible to introduce should be utilized. The many community schemes, such as canteens, which had been introduced had, he thought, come to stay. In Liverpool the Directors had spared no expense to give the men the very best facilities possible. They were serving approximately 1,500 meals per day.

He thanked his Chairman and Directors for the support they had given him during his year of office.

Sir FREDERICK J. WEST, C.B.E., J.P., proposed "The Liverpool Gas Company." He said he felt sure he would be interpreting the Association's thanks and wishes if he expressed their appreciation of the hospitality received. The Liverpool Gas Company had a high reputation for the consideration they extended to their staff and workpeople. The facilities provided at Radiant House for the workers set a very fine example. They were one of the first undertakings in the country to adopt co-partnership.

Lieut.-Col. BUCKLEY, in reply, said they were very proud of the Liverpool Gas Company. They were, in the first place, a happy family. With regard to the future they were prepared for great economic changes. In the Industry there was room for improved organization. He did not know what that was going to lead to, but if it led to improved conditions generally the Liverpool Gas Company would be pleased to assist, though they did not stand for nationalization. There would be no useful purpose served by it.

The Institute of Physics

The Report of the Institute of Physics for 1942 which has just been issued shows that special attention has been given by its Board to urgent questions concerning the training and supply of physicists needed for war purposes. The Board is able to record with gratification that its views not only coincided in almost every respect with those of the Government's Technical Personnel Committee, but were being embodied in measures that were being taken. A good deal of attention has also been given to considerations concerning the best way of ensuring to intending physicists after the war an education that will enable them to make their fullest contribution to the service of the community. A Report on this matter was prepared by a sub-committee under the Chairmanship of Sir Lawrence Bragg, and its report has been approved and adopted by the Board of the Institute and has recently been published (see "JOURNAL" of July 14). It represents the considered views of teachers in the Universities and Technical Colleges and of the Heads of Government and Industrial Research Establishments.

The Report records a record increase in membership of the Institute. The normal activities of the Institute and its Branches have continued with but little modification on account of war circumstances.

Autumn Ban on Fertilizers

To conserve supplies of ammonium sulphate for use in the spring, the Minister of Agriculture and Fisheries and the Secretary of State for Scotland have made the Nitrogenous Fertilisers Order, 1943, which provides that, except with the written consent of a County War Agricultural Executive Committee in England and Wales, or an Agricultural Executive Committee in Scotland, no person in Great Britain shall apply or use any nitrogenous fertiliser to, or on, any land between Sept. 18 and Dec. 31. This prohibition does not apply to land which is being used for the growing of market garden crops.

The monthly prices of sulphate of ammonia, before deducting the 15s. allowance, are the same as last year, beginning at £9 10s. per ton for minimum 6-ton deliveries in July, and increasing by 1s. 6d. per ton each month until the maximum of £10 2s. is reached for the period March to June next.

The allowance of 15s. per ton is given to compensate the farmer for the trouble and inconvenience to which he may be put as a result of buying sulphate of ammonia now for application to the land next spring.

Bookings of the sulphate subject to the allowance of 15s. a ton have been so numerous that the tonnage ordered for early delivery has already exceeded the quantity set aside, and the offer has been withdrawn. Limited quantities have, however, been sold to agricultural merchants for storage on condition that in reselling to farmers they will make the following allowances on deliveries: In Aug., 12s. 6d. per ton; Sept., 10s.; Oct., 7s. 6d.; Nov., 5s.; Dec., 2s. 6d.

Diary

Aug. 19.—Association of Gas Corporations: General Purposes Committee, Gas Industry House, 2.30 p.m.

Aug. 26.—Association of Gas Corporations: Council, Gas Industry House, 2.30 p.m.

Members of The Institution of Gas Engineers are invited to attend a meeting of the Institute of Fuel, to be held in the Lecture Theatre of the Institution of Electrical Engineers, Savoy Place, W.C. 2, on September 30, at 5.30 p.m., at which a Paper entitled "The Rational Preparation of Coal" will be presented by Dr. R. Lessing, and discussed. Advance copies of the Paper (which will only be presented in summary at the meeting) may be obtained on application to the Secretary, the Institute of Fuel, 30, Bramham Gardens, S.W. 5, about ten days before the meeting.

A Party of journalists representing influential national newspapers and women's magazines travelled from London on July 27 to inspect the model post-war house erected at Radiation House, Birmingham, a description of which was given in the "JOURNAL" of June 2. The Chairman of Radiation Ltd. (Mr. J. F. Davies) and Dr. Harold Hartley (Technical Director) received the guests. Dr. Hartley spoke generally on the work done by the Radiation Technical Staff, in trying circumstances, towards the improvement of gas and solid fuel appliances, emphasizing their vast potentialities for making the post-war home healthier and happier for all the family.

With the Existing Equipment, Widnes, thanks to the efforts of the local Education Authority, can actually provide every local school-child with a hot midday meal every day. There are ten serving canteens and nine meal kitchens, in the majority of which gas is the chief fuel used, and in addition the Ministry of Food Kitchen in the town provides a number of meals for children. These kitchens could cater for all the 7,979 children on the local schools' roll, though at present less than half that number—3,022—are taking advantage of the facilities to have a hot midday meal.

In Connexion with the annual meeting of the Swedish Gas-Works Association held recently, information was supplied about a new type of peat fuel, called peat-coal, now being carbonized for gas production. The Chief Engineer of the Stockholm Gas-Works, Mr. S. Qvarfort, reported that since the summer of 1942 a test retort using peat-coal has been in operation in this works. He said, in brief, that the process of gasifying peat-coal in wide-chamber retorts produced gas that was usable for direct supply if the benzole was left in. The engineer of a Swedish provincial gas-works, which has been using peat-coal, stated that gas from peat-coal of good quality could be used by consumers without any appreciable adjustment of the burners. Peat-coal is at present produced only on a limited scale in Sweden, but, according to the Swedish International Press Bureau, plans have been drawn up for increasing the output. Parallel with the actual production, research and experimental work is carried on in order to investigate the possibilities of the new fuel. In the case of a complete stoppage of the imports of ordinary coal, it is considered that the peat-coal will be of great importance for Sweden's fuel supply.

Dividends

South Metropolitan.—Interim Dividends at the rates of 4% and 6% per annum on the 4% and 6% Preference Stocks respectively for the six months ended June 30. Consideration of a dividend on the Ordinary Stock will be deferred until the close of the financial year, when the results for the twelve months to Dec. 31 will be available.

Commercial Gas Company.—The Directors have decided that consideration of the accounts of the Company shall be deferred until the accounts for the year 1943 as a whole are available. In the meantime no announcement can be made with regard to dividends on the Capital Stocks of the Company.

Brechin.—2s. 6d. per share and a bonus of 9d. per share, both less income tax.

Hawick.—Dividend for the year to May 26 at the rate of 4%, free of tax.

Stirling.—Final of 9s. 2d. on original capital and 10s. 9d. on new Ordinary capital.

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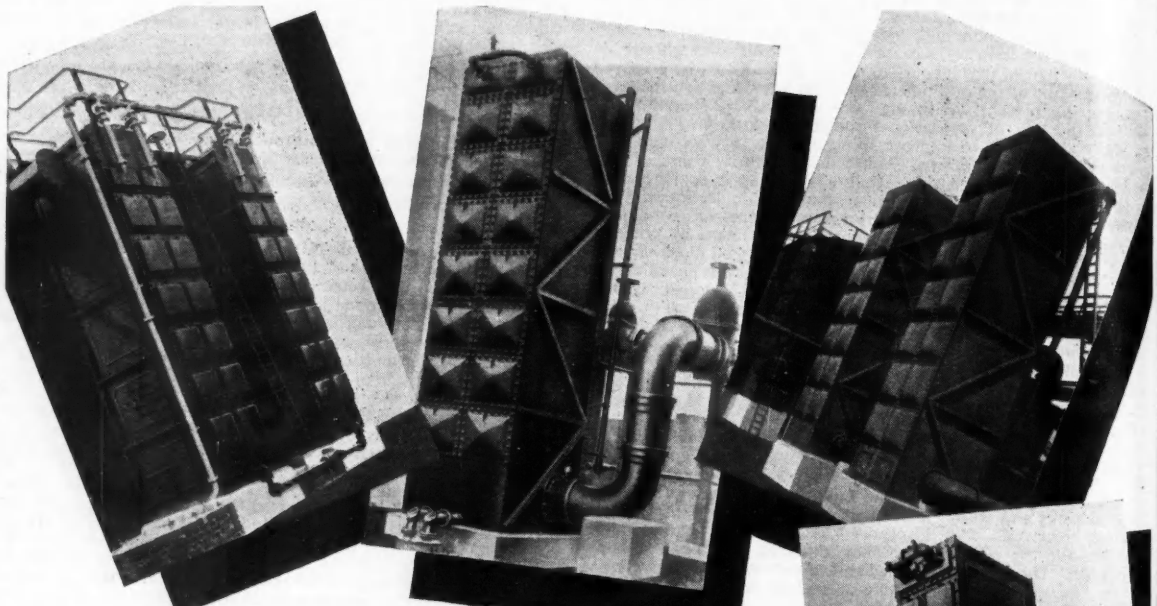

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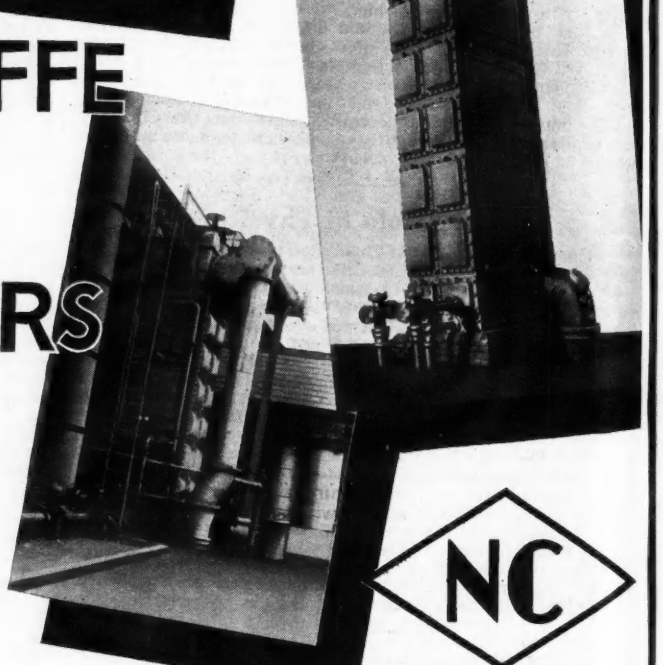

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THE DESIGN AND SUPPLY OF DOMESTIC GAS APPLIANCES

Institution of Gas Engineers, July 9.

By J. E. WHITE, A.M.I.Mech.E.

Chief of Gas Sales, Newcastle-upon-Tyne and Gateshead Gas Company

(*Continued from p. 140*)

Cookers

In cooker design thermal efficiency of the oven has been much over-stressed. As such a small percentage of the total gas consumed by gas cookers is accounted for by the oven, cooking performance should be the criterion by which the appliance is judged, and the Author would go so far as to suggest that a slight increase in gas consumption would be more than justified if an outstanding improvement in performance could be obtained.

With regard to hotplate design, there are some who consider that the hotplate of the future should be of the solid top variety; that is, either the whole or a considerable proportion of the hotplate should have a flat unbroken surface. For this arrangement it is claimed that it is easy to clean and that it provides the user with a greater cooking area than is possible with the multi-burner, open-grid pattern. The problems of combustion and ventilation below hotplates of this nature are not inconsiderable, and it is doubted if the claims made for this development really justify these complications. Gas has always claimed speed of heating and genuine flexibility as the principal features of its hotplates, but it is indeed difficult to see how either of these features are to be obtained when in both directions there must obviously be a considerable time lag. It is well to keep in mind that a solid-top hotplate will retain boiling temperature for some time after the gas has been extinguished and consequently this development would appear but to add a feature which in certain circumstances can be an embarrassment to the user. On the score of cleanliness, a large surface, the most of which is at a considerable temperature, is likely to be difficult to clean since splashings, especially if of a greasy nature, will rapidly carbonize on the hot surface with unpleasant results both in respect of acrid fumes and subsequent cleaning. It is therefore essential that any change in this direction be subject to most thorough district testing before its introduction to the public, and must not be allowed to become merely a sales point that is not substantiated by performance.

Maintenance in respect of hired cookers has always been a problem of considerable difficulty, this having increased as enamelled finishes and more complicated designs have been introduced. In 1939 the Newcastle Company decided to "up-grade" to the extent of adding an all-enamelled, thermostatically-controlled and covered-top cooker to its hire range. Before doing so a number of types were investigated to a maintenance specification calling for easy removal of all parts, including the interior enamelled linings, so as to leave the cast structure as a unit. This structure comprised front, legs, back, burner troughs, bridges and crown, to be treated as a one-piece unit for cleaning and renovation without further dismantling, whilst the thermostat and all gas connexions were to be immediately accessible. From observations so far made it would appear that cookers of this type are suitable for hire purposes.

Rational Standardization

In his Paper presented before the Institution's Annual General Meeting of 1941, Mr. R. J. Rogers made an excellent review of the possibilities of rational standardization of consumers' appliances, and it is evident that many of the proposals contained therein will find their way into post-war appliance design to the advantage of the consumer and the Industry alike. As a post-war development it is not difficult to foresee a standard cooker chassis which, by varying external treatment, will meet the requirements of many classes of consumers. Such a chassis has much in its favour, whether as a sub-unit of a complete kitchen assembly embracing cooking, water heating, clothes drying, etc., or as a unit which by progressive improvement in detail can be kept abreast of the most up-to-date practice. The value of such a unit in hired and prepayment cookers, where the introduction of any new type is always a matter of some difficulty, is obviously great since by the simple exchange of the "overcoat" the cooker may assume the lines of its most modern counterpart. It is to be hoped that the appliance manufacturers are following the enormous strides which are being made in press-tool design during the present war, and that they will not be discouraged from the use of modern methods because of capital sunk in foundry equipment, nor by the foundry tradition which has always been so apparent in gas cooker design. New tools, new methods and new materials, all of which have been brought to common use by war-time conditions, offer to the appliance manufacturers the opportunity to produce a cooker, or indeed any other gas appliance, having lines such as will be demanded by a "streamline" age, together with detail refinements such as electric lighting within the oven operated by the opening and closing of the door, mains electric ignition of all burners, and, by the use of light metal alloys, a most welcome reduction in quite unnecessary weight. A plea is made here for improvement in assembly methods; the round-headed screw, with or without nut but without any form of locking device, is no longer acceptable, especially in such units as cooker lids and other moving components.

Many of the foregoing comments on cookers have had a "utility" background, with emphasis upon the hired appliance side, which is perhaps not unnatural in days when so much thought is being devoted to the re-housing of the working class population. It must be remembered, however, that there is very probably a far greater scope for development in the middle and upper classes. Generally these are more receptive of new and labour-saving ideas, but in competition they are more "vulnerable" and consequently the standard adopted by gas must always be at least equal to the best available elsewhere—appliances in this sphere should be built up to a standard and not down to a price, and there should not be the slightest hesitation on the part of the appliance manufacturer in introducing electrically-operated devices if by doing so the standard of the gas appliance is raised. It is a tactical error not to wed the advantages of electrical power and lighting to gas-consuming appliances, for the day of the hand-turned wringer and the non-illuminated oven are gone, even as the hand broom has fled before the vacuum cleaner. The Author's Undertaking is experimenting with mechanical air circulation in gas-heated clothes-drying cabinets, which, it is believed, will form an important part of post-war kitchen epuipment.

Unit Construction

From a study of many well-informed documents* dealing with post-war architecture, and from practical investigation into public reactions made possible by experimental work by the Author's Undertaking, it is evident that unit construction of kitchen equipment is universally accepted by architect and householder alike. The possibilities of this development were referred to by E. Crowther in the Paper† he presented at the Institution's Annual General Meeting in 1942, and as the demand for unit construction is increasing his remarks are here reiterated.

> "A substantial advance in standardization of parts and fixtures of every class is at hand. Perhaps as significant a feature as any, from the point of view of the Gas Industry, is the suggestion that 'furniture' should largely become an in-built part of the house, a suggestion which clearly points the way to a similar treatment of gas-consuming appliances of every kind, built to conform to standardized space provisions and arrangements.
>
> "Such a development is most desirable, as it immediately disposes of two difficulties which have long proved an obstacle to the Industry; the first that certain gas appliances, notably cookers and water heaters, duplicate the functions of solid fuel arrangements incorporated in the fabric, so that an unnecessarily large capital in total is associated with the house; the second, that in consequence of these arrangements it is often found difficult to accommodate such appliances, and impossible to locate them at the most convenient point. The fact that such duplication

* "The Hub of the House." Evidence to Ministry of Health Central Housing Committee (Sub-Committee on the Design of Dwellings) by the Association for Planning and Regional Reconstruction.

† "The Gas Industry in Relation to Post-War Domestic Architecture", *Inst. Gas Eng. Comm.* No. 248 (1942), pp. 12 and 13.

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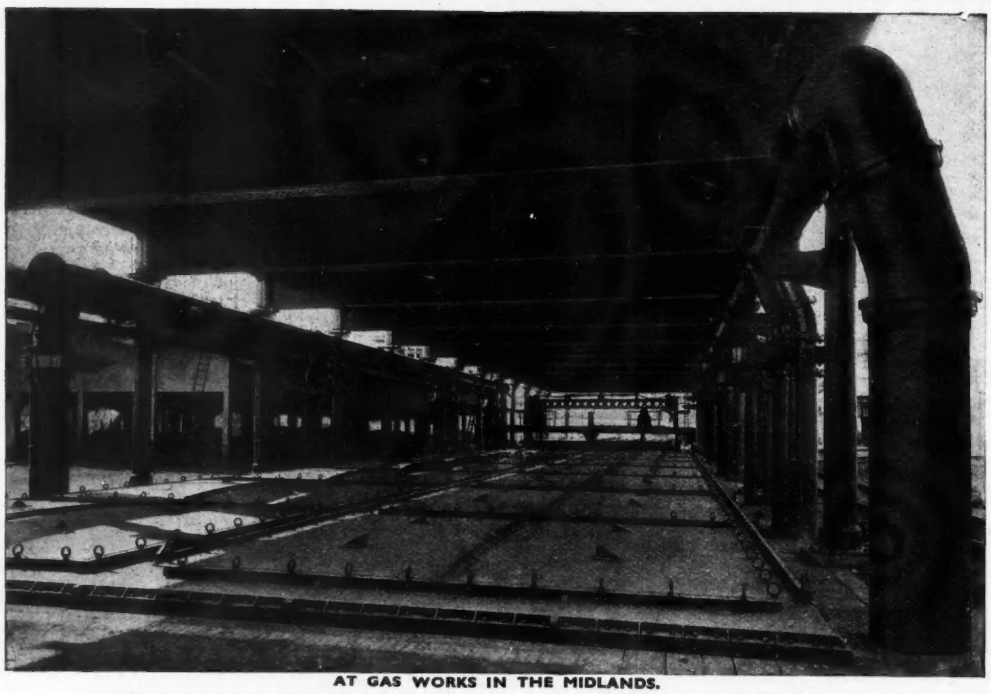

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takes place in so large a number of houses, in spite of the difficulties named, is in itself clear evidence that the need for these gas appliances exists; it is for the Industry to demonstrate the fact so conclusively to the architect that his future practice will be to introduce these appliances as an essential part of the structure, and to omit the obsolete solid fuel appliances which they have superseded."

Since the presentation of that Paper the attempt at unit construction has been inspected by more than three thousand housewives, and as a result of their suggestions and general approval the unit has been extended so that it now embraces (*a*) clothes dryer, (*b*) small drying cupboard for tea towels, etc., (*c*) gas cooker, (*d*) cooking utensil cupboard, (*e*) water heater and 30 gal. storage cylinder, surmounted by (*f*) plate warmer and (*g*) large dimension airing cupboard, the last-named housing the ventilating canopy to which all the appliances are connected. The services covered by this unit are not complete since they do not include clothes-washing or refrigeration facilities, but it probably serves as an indication of the essential household services which can be accommodated in 7 ft. by 2 ft. 6 in. of the floor space available. This is a considerable economy when compared with the area required by individual appliances for the same services.

It is said that the kitchen of the future will be larger, but it is as well to keep in mind that in the past final cost played an all-important part in housing expenditure undertaken with public funds. With this in mind, the case for gas is enhanced, for it probably offers a more efficient utilization of the floor space available than any other form of fuel.

As has already been shown, the principle of unit construction in domestic equipment has definite attractions for the public and the Gas Industry, and it has equally great attractions for the appliance manufacturer. It is, however, no small undertaking nor will it be achieved without full co-operation between all the interested parties. Perhaps then in the overcoming of difficulties and in the satisfaction of achievement, it is not too much to hope that the term "unit" may be expanded to unity—the unity of purpose of two great industries, the futures of which are indissolubly joined.

DISCUSSION

Dr. **Harold Hartley:** "In the preparation of any policy in respect of the design and supply of domestic gas equipment, first consideration must be given to the requirements of the user." This quotation is taken from the opening sentence of the second paragraph of Mr. White's Paper. I would like to remind Mr. White, and through him the manufacturing side of our Industry, that decisions have yet to be taken as to what services it is possible to offer the community in the post-war period, and that it must be borne in mind that before the war about three-quarters of the families had a gross income which did not exceed £4 per week. Hitherto the appliance manufacturer generally has had to try to provide the answer to that question and, with his experience, he has been reasonably successful in finding the right answer. After the war advantage should, if possible, be taken of the opportunity that will be available to undertake a much larger proportion of the supply of the heat services needed by the domestic consumer. In the past the Gas Industry has had only about 20% of the load.

The Author speaks of the foundry tradition as apparent in gas cooker design. The cast iron cooker has persisted because of the selling policy of the Industry. The appliance manufacturers have introduced modern foundry equipment because a big demand in the past has been for a cast-iron cooker. The most modern enamelled cast-iron cookers are fine products, and it was only by the use of castings that the very diverse demand could be met economically. It must be realized that it is not economic to utilize pressings for the making of an article required in relatively small quantities. In the past, gas undertakings wished the apparatus manufacturer to incorporate detail variations so that the appliance should conform with their own views as to what was technically most satisfactory.

The Gas Industry has it in its power to supply a complete fuel service, and should gain much of the domestic load provided it realizes that there will be a need for coke-burning apparatus as well as for gas appliances.

With regard to improvements which are possible, some 20 years ago thermostatic cooking was introduced to this country. Amended designs of ovens with higher products' concentrations were used and more uniform cooking results obtained. The gas appliance is still used in the majority of homes for cooking, and the quality of domestic cooking in this country has improved considerably in that period. For this, our Industry can claim the credit on behalf of the thermostatically controlled gas cooker. There is some room for further improvement, and this will be effected with due recognition of the fact that the standards of performance required in different parts of the country are different. As I mentioned on another occasion, "We are no longer concerned solely with thermal efficiencies, but investigate all phases of the problems connected with the supply of heat services to the home. The chemical and physical changes taking place during the cooking of food are examined in detail, and the behaviour of carbohydrates, proteins, and so on, in the gas oven, and under a variety of conditions in the laboratory are closely watched, and as you know, a great deal of energy and money has been expended in producing reliable instructions for the housewife in the preparation and cooking of food."

We also study the results attained in electrically-operated appliances and with solid fuel apparatus. There are differences existing in an internally-heated gas oven and an externally-heated oven. Those who have the knowledge can see the difference in the product. Is it realized, for example, why meat roasted in a gas oven may be redder on the surface, and more pleasing in appearance as a result, than meat roasted in an electric oven or a coal range? This type of apparatus is investigated and the results are applied to the design of the oven. Products concentration, energy input, distribution of energy throughout the oven, heating by radiation or by convection—all these factors have to be considered in constructing an oven.

In the last 20 years some progress has been made with the electric cooker, as compared with the gas cooker, in the relative amounts of energy required for cooking operations. The efficiency of the hotplate of the best gas cooker of to-day is lower than that yielded by the high-grade cookers of 1923. The reasons for this are well understood. In the post-war period, cooking by gas should have a new lease of life if advantage is taken of the real advances that will be made available. The Author's remarks on hotplate design are pertinent.

As to space heating, much can be done to increase the efficiency attained with the gas fire, by paying attention to the method of fitting it in a living-room. If, instead of building-in a fire or fitting it at the foot of a chimney, as is done to-day, the fire can be stood in a recess, then the overall heating efficiency may be increased by some 25%. Still further increases in overall efficiency can be attained by the additional supply of convected heat. The method of fitting I am advocating much simplifies the provision of convected heat. I am glad the Author's experience confirms that a step forward has been taken and maintenance simplified with the introduction of the luminous flame gas fire.

It is not difficult to design a water heater giving a high thermal efficiency. Thirty years ago instantaneous water heaters were being supplied which had an overall efficiency of 97%. To-day the majority of water heaters have a heat transfer efficiency of between 70 and 80%.

Maintenance costs do seem to depend on the rate of input of energy; the Author tells of the relatively low maintenance cost of a particular circulator. The undertakings are supplying to-day storage type apparatus of which the prototype appeared some 25 years ago, which is well known as cheap to maintain. At these lower consumptions, the problems due to sulphur and nitrogen oxides are less acute. Nevertheless, it should not be impossible to produce designs of high and low consumption water-heating appliances which will require but little maintenance, and the manufacturing side of the Industry can reasonably expect such apparatus to be available in the post-war period.

The Gas Industry should have a great future in the domestic field if its leaders in their various spheres do their jobs properly, so that full advantage is taken of the results which follow from the wise use of gas and coke in their respective fields.

Mr. C. A. Masterman: Mr. White's Paper is a double challenge as to what appliances we want and how we are going to have them available in time after the war. I sympathize with the manufacturers who ask how they can get on with design until they know what the Industry wants, and with the Industry which cannot decide what it wants without seeing samples of what can be produced. But the end of the war will see the release of millions who will want to set up homes and who will not be put off by excuses. We know it takes longer to design and produce a new gas appliance than a new house, and so far as is physically possible we must get busy with our appliance designs now.

Mr. White's outline of objective on the second page of his Paper only serves to emphasize how far we yet are from reaching it. In part this is the inevitable result of competition, which I am the last to under-value as a spur to progress. But in the appliances which will be required in vast quantities at low prices after the war we are not seeking those novelties which are subject-matter for proprietary rights, and must remain secret until they can be commercially launched. It is the utility appliances which are of first importance, and on which surely the makers can co-operate to produce samples as soon as possible. The undertakings might then be able to build up their own plans and, co-operatively, as a *quid pro quo*, provide the makers with a more reliable estimate of probable future requirements, and a guaranteed delivery-rate to ensure maximum economy in production.

I would like to see utility samples of the following:

(*a*) The post-war cooker with better grilling facilities.

(*b*) The post-war heater requiring less maintenance.

(*c*) The post-war fire giving warmed air as well as radiant heat, and with indestructible radiants.

(*d*) The post-war coke stove and water heater combined with lagged storage, able to heat the water by low price gas in summer and so assist our seasonal load factor.

(*e*) The post-war flueless gas heater on gas not exceeding 10 gr. sulphur.

I sympathize and wholly agree with Mr. White's distrust of unnecessary complications, which only add to maintenance costs for

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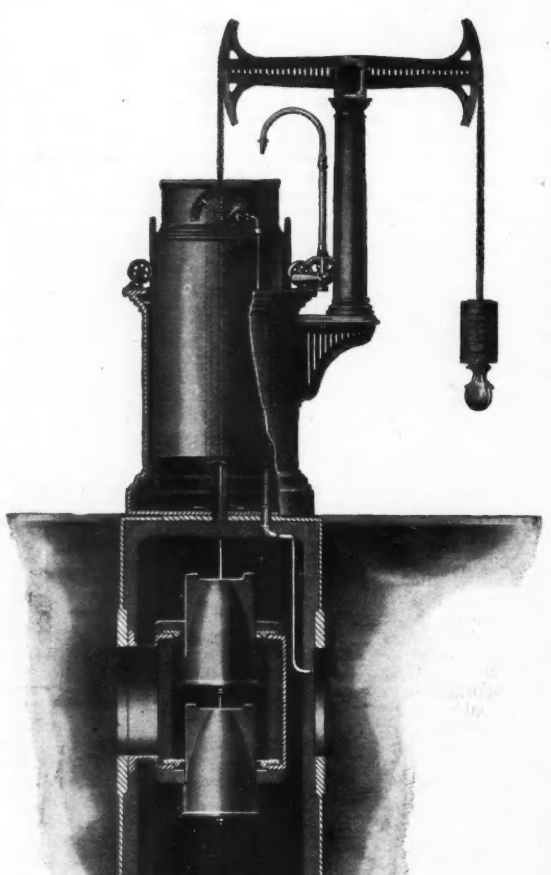

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which the consumer in the end must pay. Before the war the appliance, one way and another, often cost more than did the gas it used. But surely we may look forward to some reasonably reliable and simple way of lighting the gas, not involving the use of matches. The match shortage has thoroughly underlined the deficiency of gas appliances in this respect in the eyes of most users.

In the higher price field can we hope for the development of a domestic washing-up machine? Housewives who now find washing-up an unfamiliar task are prepared to pay several shillings a week to be relieved of it. Several shillings a week capitalizes into a substantial sum well able to cover quite an ambitious appliance for the purpose, and gas is the obvious fuel for the job.

Finally, there are three important gas features I would like to see brought to the attention of all housing authorities, but which scarcely involve the makers of appliances. Drying and airing cupboards depend chiefly upon free air circulation, and are conveniently able to be constructed on outside walls as part of the house, with air bricks top and bottom, together with a small gas heater at the base. I much prefer this to Mr. White's self-contained cabinet.

Solid fuel appliances, without exception, should be provided with gas ignition—an arrangement requiring no special or complicated device if fitted where the fire is installed. This is an incomparable convenience to the householder and, if universal, would add 10 to 20% to the total sales of gas.

Substantial economy in gas and speeding-up of operations on the hotplate are achieved by using kettles and pots with finned bases. I know we cannot go into the ironmongery business, but the use of such vessels does deserve our fullest encouragement. In that connexion, at home I have abolished the use of the kettle altogether, and save immense trouble and time by using the boiling water type of sink heater which, if scale trouble can be overcome, deserves fuller recognition after the war.

I end by quoting Mr. White's aspirations that "the Gas Industry will indicate with united voice what it requires of the appliance manufacturers," and that "these manufacturers, working together in common confidence and trust, will take the Industry wholeheartedly into their councils."

FUEL ECONOMY IN GAS WORKS No. 10

We are indebted to the Severn Valley Gas Corporation, Ltd., and Gas Consolidation, Ltd., for permission to reprint a series of notes specially compiled for them by G. M. Gill.

CONTINUOUS VERTICAL RETORTS

MOST engineers with continuous vertical retorts realize how helpful it would be to know how much coal is daily carbonized in each retort. Theoretically, with the provision made by the makers, this is obtainable, provided that there is good co-operation by the staff and workmen. The Author has observed, however, that it is rare indeed for the quantity of coal carbonized per retort per diem to be obtainable in practice, and he was therefore particularly interested to observe during a recent visit to the Deal and Walmer Gas-Works that the Engineer and Manager, Mr. Stewart L. Wright, had devised and put in operation a simple and remarkably accurate system of recording the quantity of coal used by each retort per 24 hours.

The system is based upon that originally developed by the Woodall-Duckham Company, and described in their publication, *Operation of W.D. Continuous Vertical Retorts*, but Mr. Wright's system goes further and makes it easier for the workmen and staff to co-operate, and together arrive at a close approximation of the total coal carbonized per diem and also the quantity used by each retort. The Author reproduces the description by Mr. Wright.

The Coal Box Inch-Hour Factor

On a small installation of continuous vertical retorts without means of weighing the coal elevated to the retort house coal bunkers the determination of the quantity of coal carbonized depends upon an estimation of the amount of coal in stock considered in conjunction with the amount of coal received into the works.

Discrepancies in stock estimation seriously affect the results when the amount of coal carbonized is small, and thus, although the system may be accurate enough for monthly returns covering over 500 tons of coal, it tends to fail when weekly quantities are under consideration, and it is completely inadequate and too laborious for daily use when coal is arriving irregularly, and supervision is rendered difficult by shortage of staff.

It is undesirable that inefficient carbonization should remain hidden until results are calculated at the end of a week, and therefore a system of indicating the amount of coal carbonized in each individual retort has been devised, making use of the indicator chains on the coal boxes of the Woodall-Duckham vertical retort system.

The indicator system consists of a weight on a chain within the coal box attached by means of twin pulleys to a chain and ring outside the coal box. Before a coal box is filled with coal the weight is drawn to the top of the box and the ring slipped over a hook at the bottom of the box outside. The chains must be so adjusted that when a box is filled with coal the bottom of the ring hangs level with the hook, which is taken as the zero mark. Sketch A shows the condition at this stage.

Vertical graduation marks at 5-in. intervals are made on the outside of the coal box starting from this zero mark, numbered upwards 5, 10, 15, &c., up to 30. The spaces between 15 and 30 are further subdivided into 1-in. spaces (Sketch B).

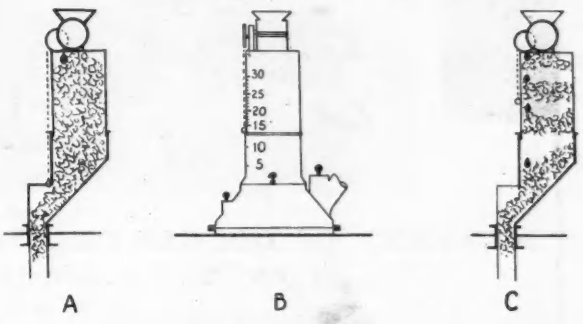
As the coal drops into the retort the weight follows it, raising the indicator ring, and at the end of the hour the bottom of the ring will be opposite a division on the scale which is noted by the top man before he refills the coal box. A reading of 20, for example, would mean that the coal level inside this box had dropped by 20 in. in one hour, and as the boxes are of uniform section in the upper portion this represents a definite volume of coal which has travelled into the retort, assuming that the surface of the coal in the box retains the same shape as the coal box empties.

The method of converting the coal box inch measurements into tons of coal is to total the hourly coal box inch readings for all retorts for a month, and to divide this total into the total coal carbonized for the month as determined by weight of coal received and stock measurements.

The result is expressed as a decimal of a hundredweight to the nearest two places of decimals and is described as the coal box inch-hour factor. This factor is used for the succeeding month. Each day the coal box inches are totalled for each retort, multiplied by the coal box factor, giving a figure for the coal carbonized in each retort for that day.

The factor is checked each week by comparing the carbonizing book figure for coal carbonized with the weigh office figure for coal received corrected for stock difference. It can also be roughly checked by levelling the main coal bunkers and running for 24 hours without elevating any coal, then relevelling the bunkers and calculating the coal used from the volume of bunker space exposed.

I would refer back to my statement that the coal box measurement represents a definite volume of coal which can be calculated from the cross-sectional area of the box, assuming that the surface of coal in the box retains the same shape as the coal box is emptied.



Messrs. Woodall-Duckham themselves show various states of coal surface in the coal box in their illustrations, which are reproduced in Sketch C. It seems reasonable to assume that the coal surface varies as indicated as the coal leaves the box, and this is borne out by the fact that the coal box factor is found to depend to some extent upon the rate of throughput of coal through the retorts.

Another matter that has to be taken into consideration is the coal used when recharging a retort after scurfing. We have calculated that 26 cwt. of coal are used to fill the retort and coal box after each scurfing period, and this is added on to the figure calculated from the coal box inch-hour total on the day that the retort goes off for scurfing, which is when the coal is finally carbonized.

The method of arriving at the factor from the monthly totals and the standard of agreement attained is shown in the following table setting out our results for three months:

	December.	January.	February.
Coal carbonized determined from coal received and measured stocks	726.9 tons	630.3 tons	612.05 tons
Number of retorts put off for scurfing during the month	6	2	4
This number times 1.3 tons represents coal not included in the coal box inches total	7.80 tons	2.6 tons	5.2 tons
Whence coal represented by coal box inches total	719.10 „	627.7 „	606.85 „
Total of all coal box inch-hour measurements for month from stokers' sheets	52,325	44,523	43,358
Whence coal box inch-hour factor for month	0.275 cwt.	0.282 cwt.	0.279 cwt.
Average daily throughput per retort	5.79 tons	6.03 tons	6.00 tons

The factor taken throughout was 0.28 cwt.

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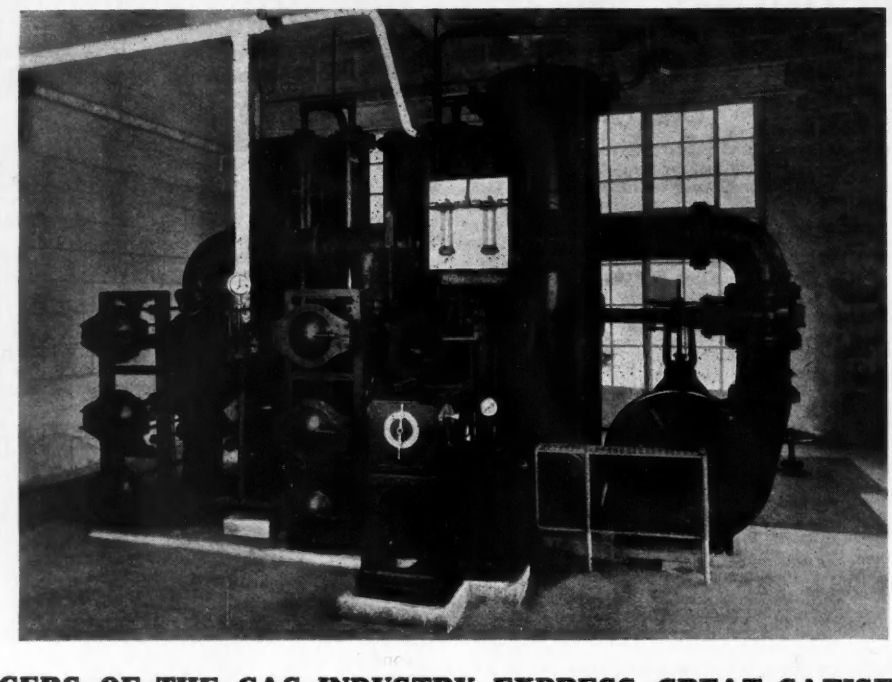

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CARBONIZING PLANT PROBLEMS*

By the ENGINEER and GENERAL MANAGER of a Gas-Works in Southern England

THE works concerned were built in 1851, and to-day, owing to the small distribution area, would be classified as "small to medium" in size, with an annual output of 500 million cu.ft., or 2½ million therms. Gas is made by horizontal and vertical retorts, plus carburetted water gas. The district is chiefly residential. The capital expended, including nominal addition on conversion, amounts to £556 per million cu.ft. made, or, in possibly less familiar terms, £107 per 1,000 therms made.

Discovery as to whether one is in possession of obsolescent plant can, generally speaking, only be determined by close and regular scrutiny of the Technical Press, by visiting other works (whether in the vicinity or not), by attending every available Institution or District Association meeting, or by very close contact with the representatives of the technical and engineering branches of firms interested in the Gas Industry and in gas-works plant. This, of course, is a full-time job, but there is no doubt about its being a paying proposition. A tribute should be paid to the directors and chemical and engineering staffs of the larger gas companies who devote much time and money in carrying out complete operating tests of new plant, in order to search for imperfections and inefficiencies, with a view to improving future designs. In due course their results are reflected in new plant offered by manufacturers.

Our experience suggests that manufacturers do not appear to employ sufficient technical representatives with scientific qualifications to follow up their plants, with the object of collaborating with gas engineers, and seeking improvements; particularly so in regard to horizontal retorts. This system, of course, is the oldest of the methods in present-day use, and the practice in detail appears to have found a stabilized rut. Much of the contact to-day is carried out by commercial representatives who cannot give the necessary time for close investigation.

The problem of serious rebuilding arose in 1911, when the retort house was degutted of its direct-fired settings and early regeneration, in favour of modern settings with stage floor and stoking machinery.

Was this well-built house to be demolished, and a new one erected on a new site with some degree of parallelism usually associated with gas-works layouts? Or, were the sound 23 in. walls to be raised to the new requisite level to accommodate bunkers and other machinery? As a matter of fact, it would have been very difficult at this stage to place the one and only retort house anywhere else, owing to the presence of other vital apparatus ancillary to the carbonizing plant occupying the coveted space.

Hence the original house was re-used. The walls were raised to the new level to accommodate stage floors, storage bunkers, elevators, conveyors, &c. The old principles were then replaced. The new unit comprised 10 beds of 8 retorts, 23 in. by 16 in. by 20 ft. through, charged by a Fiddes Aldridge simultaneous charger and discharger. The regenerators were of the Klonne type, ascension pipes were 8 in. in diameter, and fixed on the charging side only. It was a typical installation of that day, and completely modern with the exception that coke-handling plant was omitted.

Owing to regular yearly increases in output, it became necessary in 1924 to pull down the gable end wall opposite the 10th bed and to add another six beds of 8's on exactly the same lines as before. In other words, the house was extended from railway to roadway, which was the extreme limit of expansion.

In 1928 a Guest-Gibbons charging machine was installed to supplement the F.A., which had carried the load with credit and quite alone for 17 years. To the engineer who lives on the job a works with one machine only is a constant source of anxiety. Continuous increases in output were the order of the day, and by 1930 it was obvious that further new gas-making plant was required. Owing to the small amount of land available for manufacturing purposes, the choice was restricted to vertical retorts, and an installation of 16 40-in. Glover-West retorts was put in hand having a capacity of approximately one million cu.ft. per day of 470 B.Th.U. gas. The area occupied by this plant is only 50 ft. by 40 ft., and the house was placed so that expansion or extension could be carried out if desired.

This extension caused a major upheaval and necessitated changes of residence by the staff, and on the new land available it was decided to build new purifiers, to wash, scrub, and meter all three gases separately, and to enlarge all works mains to suit the new plant. Thus we appeared suddenly to expand to proper dimensions, spending a large amount of capital wisely and well.

By the time this new work was completed it was necessary to give attention to the horizontal retort house, to bring it up to date and to increase its capacity.

Reconstruction

It is possible to be hesitant in making a start on refinements to a house which is producing a reasonable amount of gas, of a reasonable quality, owing to difficulties in reconstructing while the house is at work. But, as coal is the nation's lifeblood, and as dividends are still made in the retort house, one cannot continue to carbonize coal inefficiently if more efficient methods are known and available. Plans were therefore drawn up to bring the horizontal house up to date on a yearly programme basis, and the first choice in this efficiency campaign was to install a Spencer-Bonecourt high velocity firetube boiler.

The boiler was placed outside the retort house, at right angles to the settings, in a house specially built for the purpose. It is connected to the main flue by an underground duct, steel cased, firebrick lined, and insulated. Thus the dark, dreary, and hot conditions sometimes associated with waste heat boilers were eliminated. The boiler house is of ample proportions, well lighted and ventilated.

The second stage was to fix ascension pipes to both sides of the house. Seven-inch ascension pipes, Bournemouth arch pipes, Cort's anti-dips and hydraulic mains were fixed on the discharging side, together with the necessary bench bracings. Following this, Cort's anti-dips were inserted in the hydraulic mains on the charging side.

The whole of the top bench ironwork was then tidied up, and divided into three sections; the collecting mains were connected with balancer mains, and the existing retort house governors were overhauled and re-used. Thus there is a governor for each five beds, and each governor is capable of taking on a larger number of beds if required.

Soon after this phase of operations we were, in our effort to produce more therms, tempted to try our hand at steaming the horizontal charge, and considerable time and money were expended on the project. Those who have gone into this aspect of carbonization will know of the large amount of piping, fittings, and special valves required for the job. In our case it meant fitting up 128 mouthpieces to a special steam range.

After giving it a thorough trial we came to the conclusion that only really full charges could produce anything like a worthwhile reaction, and we were, at this stage, unable to fulfil this condition. In addition we suspected erosion of the fireclay ends adjacent to the steam inlet; our steam was too wet, and we produced the usual larger quantity of weak liquor. These are faults which are known to anyone who has experimented with the system, and we were glad to abandon the scheme. It was not all loss, however, as experiments of this kind keep one in the retort house, shift after shift, and are always profitable in other directions.

While this work was proceeding, we took advantage at every re-set to pull out the remaining old Klonne regenerators, and to rebuild with Gibbons & Masters A.B.C. regenerator block; furnaces were enlarged to the maximum capacity available, and new step grates and large single doors without bottom catches were fixed. The water supply to the furnaces was filtered to ensure unrestricted and continuous flow. These improvements were carried out so that we should be in a position to provide ample producer gas for burning off the heavier charge we were hoping to secure at a later date.

Thus far had we proceeded with our programme when World War II broke out, and we still had two important items to complete. The first was a method of handling the hot coke mechanically, and the second was a method of increasing the charge. Owing to the man-power problem the coke handling problem took precedence.

In peacetime, given the right type of labour, the barrow handling of hot coke on a small works with medium charges can be reasonably economical. It is, however, a crude method, and should be done away with wherever possible.

Everyone engaged in gas-works management knows of the extra volume of work which war brings in its trail, and in consequence the "blitz" caught us still handling coke manually, and endeavouring to plan a method which would fit the triangular piece of ground available in the yard on the discharging side of the house. "Blitz" conditions, moreover, involving continuous "alerts" and night bombing, brought fresh problems, and owing to the glare associated with barrow handling of hot coke and other causes, night stoking became intermittent. Daytime saw hectic charging to make up the total quantity of gas required. Departures from normal practice, however, bring results which are, as yet, not to be found in the Gas Industry's text-books, and the evils produced are cumulative. No doubt it will be someone's task, after the war, to assemble all the knowledge and experience gained for the possible benefit of future generations.

Thus, when mass charging was introduced, instead of intermittent, large quantities of gas leaked into the settings, because the governors were not designed for the abnormal load. Coal gas hydrocarbons were passed to the waste heat boiler and deposited in the tubes in the form of a sticky mass which was exceedingly difficult to remove. Mass charging obviously overloads exhausters and any other apparatus which happens to be on the small size.

The Fleuve System

We decided to adopt the Fleuve system of hot coke conveying, and as our No. 1 coke cutting and screening plant was inadequate for present-day needs, we decided to elevate the coke from the Fleuve static screen to a new coke plant by means of a fully automatic type of skip hoist, the contract for the whole of the work being placed with Messrs. Gibbons Bros.

* From a Paper to the Southern Association of Gas Engineers and Managers (Eastern Section).

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As usual, the space bogy was the acute problem, but by pulling down a laboratory and gas testing room, it was just possible to excavate the necessary breeze pit, suction pit, and skip hoist pit, at a point between the 10th and 11th beds. Thus, instead of the more usual practice of leaving the retort house at one end, and continuing the trough in a wide sweep for the better cooling of the coke, we had to be content with a Y junction two-thirds of the way down the house, delivering into a short length of trough to the static screen.

The total horse-power required for the complete scheme was 49, made up as follows:

Coke skip hoist	11
Water pumps	19
Coke cutters	8
Coke screens	6
Breeze hoist	5

As our existing generating plant was already working to capacity, we approached the Joint Electricity Authority for a special tariff for power purposes. Much to our surprise, we were informed that the local D.C. supply mains were inadequate for their day-to-day requirements, and no further supply could be given.

To those of us who have enlarged our gas mains to suit new consumptions, this decision of the J.E.A. may savour of the Victorian era, but I can assure you that this body are not so backward where public lighting or housing estate loads are concerned.

To overcome this difficulty we were fortunate enough to secure a permit to purchase a Belliss & Morcom compound steam engine direct coupled to a Lancashire D.C. generator giving an output of 75 Kw. at 230 volts. This change in programme naturally caused an alteration to the plans of the pump house; thus, a modest and unattractive pump house became an attractive looking power house with the necessary panels for controlling the electrical apparatus, and an interconnexion circuit to connect with the old existing generator room. Provision was also made to house a duplicate generating set at a more favourable opportunity.

The power house is lofty, constructed with an eye to A.R.P., and the floor made dustproof by the use of red Terrazzo paving laid by the Great Metropolitan Flooring Company.

The whole of this work from the pre-cast troughs, to the completed bunkers and coke cutting and screening house, was carried out by Messrs. Holst & Co. The troughs were cast on site, and each section weighed anything up to 4 tons. They are lined with blue Staffordshire tiles shaped to the correct profile to withstand the abrasion of the travelling coke. The troughs are mounted in the usual way on the steel framing of the stage floor, each section being bolted together and caulked with a lead wool joint. There is a fall of 1½ in. per 10 ft. run from the ends where the water enters, to the Y junction and outside discharge to the static screen. The trough is provided with a reinforced concrete chimney at the point of exit from the retort house and the whole covered with chequer plate. Thus there is no escape of quenching steam in the house itself.

It is necessary to describe the working of the skip in some detail in order to appreciate its smooth and automatic action without any more exertion than the pressing of a button by a stage foreman.

The control gear is of the automatic contractor type supplied by the Brookhurst Switchgear Company.

The skip itself is a rectangular, welded steel plate box of 15 cwt. capacity, carried on a four-wheeled chassis, wound by an 11 h.p. Lancashire hoist motor using a single wire rope of 2⅛ in. circumference.

The hoist and its appurtenances were supplied and erected by Messrs. Strachan & Henshaw, of Bristol, and, as previously stated, is of the fully automatic type, in which the cycle of operations—*viz.*, hoist, pause, lower, pause for filling—is repeated automatically until brought to rest by push button.

The speed of the skip on the steep section of the track leading out of the pit is 70 ft. per minute, but this is increased as the skip rounds the bend to 100 ft. per minute on the flatter section, thus maintaining the h.p. requirements fairly constant throughout the hoisting period, since the rope load, and hence the torque on the winch, has decreased when the speed has increased.

The filling of the skip is carried out by a standard form of automatic skip filler of the radial gate type attached to the bottom outlet of the ground hopper. This filler is opened by the descending skip during the last few feet of downward travel, and is closed by counterweight as the skip is hoisted away after a pause of up to 10 seconds, effected by a time delay relay on the contractor panel. Overfilling cannot take place.

The pumps are horizontal single stage centrifugal by Lee Howl & Company, with 8 in. discharge branches and 10 in. suction branches. They deal with 1,500 gallons of hot water per minute, and are direct coupled to special Lancashire totally enclosed Fankuld dust and weatherproof motors of 19 h.p. The temperature of the water is between 120° and 140°F. and, of course, it contains a large amount of coke and breeze particles. The impeller is two-bladed, and all parts are specially designed to deal with these harsh conditions.

The breeze pit is emptied by a Strachan & Henshaw electric hoist with single rope and winding gear operating a Westwood hand tipping type of grab, delivering wet breeze to a breeze bay, the operating control being placed at ground level. A Harrison type coke bus is used for receiving the hot coke from the top and top middle retorts for diverting into the trough, or for feeding the furnaces, while a simple smaller bus receives coke from the bottom middle and bottom retorts. Both buses travel on overhead rails. Thus, if the full plant is in use, the coke is handled mechanically from the moment the machine has pushed out the red-hot charge, until it is weighed into sacks on the coke loading platform.

The complete job was put to work on July 1, 1942, having taken nine months to construct, and although there were many new operations all commencing together, there were remarkably few teething troubles, or few features which we should have preferred to perform by other methods. Experience has since shown us that the breeze or silt problem is greater than we were led to expect. Breeze is removed from the pit once or twice a day, but we were surprised at the amount of very fine breeze which is carried over in suspension by the return water to the suction pit, necessitating its removal by our mobile tractor crane every four or five weeks.

We have doubled this period by designing a filter made from brushes as used by Messrs. W. C. Holmes & Co. in their washer scrubbers. This is satisfactory up to a point, but there is no doubt that we shall be obliged to fix a permanent grabbing unit across the suction pit, so that it can be emptied more frequently, without the necessity of using plant urgently needed elsewhere.

If we were redesigning the plant again we should probably have made the breeze pit grab serve the dual purpose of emptying both breeze and suction pit.

Heavier Charges

Having put the plant into full operation we were in a position to tackle the question of heavier charges. Since 1928 we had been using the Cook type head on the Gibbons machine, and the charges were on the light side compared with modern requirements. The head was heavy, and the conditions under which it laboured necessitated frequent renewals to the front push plate, and to the various side flaps for carrying the coal into the retort. In addition to these points, we found that the charge varied quite a lot, dependent upon the type and size of the Durham unscreened coal in use. Conditions vary so quickly that it is not policy to make special adjustments to meet them.

We therefore decided to test out a new type of charger head made by Messrs. Gibbons Bros. and known as the "M" type, and at the same time we substituted the old vertical pointer method of charging indicator for the dial type. The new head proved to be an unqualified success. It is very simple in construction, light in weight, robust in operation, and lays what is known as a "beautiful" charge.

The front push plate is of massive design, and will push out any sort of charge with ease. The head is fitted with a small plough which moulds a gasway over the top of the charge, so that "bunging" the charge is impossible. It is a great advance on anything we have used before. The weight of the charge has increased by about 20% and hence the capacity of the house by the same amount. The thermal value has increased, likewise the quality of the coke. There is less scurf than before, and fewer, if any, stopped pipes. The first shot does not require pushing up. Owing to the lighter weight of the head, less current is used for discharging and charging, and we expect a longer life from the silica segments forming the floor of the retort. There are no adjustments to make or fittings to replace. It has been in constant use for the past six months without any attention whatever, and shows little sign of wear.

Ventilation

Ventilation was a serious problem in the early days of the blackout. We began by fixing light-proof louvres in windows and doors, but on a hot summer night they are not effective. A state of desperation usually produces something efficient, and we were able to evolve a ventilator which is cheap and really effective. It is made from light barrow plate in the form of a hollow box tee, 2 ft. square in section. The tee is laid flat with the leg inserted into the wall and supported by light joists or tee iron. The long limb of the box tee is 6 ft. in length, and the short insertion piece 2 ft. long, which is sufficient to prevent any direct leakage of light from the interior.

When the house is closed up at night the cool air enters the lower ventilators in large volumes to replace the hot air travelling upwards to the Jack roof, and to other box tee ventilators fixed at the top of the gable end and on the slope of the roof.

These ventilators are equally effective in the daytime, and we have fitted them to engine rooms and lobbies in various parts of the works.

This brings the horizontal house more or less up to date, and we expect it to yield results which should not fall far short of those produced by a new plant. There is no doubt that given good conditions with free scope in the design of producers and other appurtenances, horizontal gas plant can be worked very economically with a comparatively small amount of supervision.

In our case, all damper measurements are carefully checked and recorded several times a week at the same time as the temperatures are taken. Cost sheets of all three gases are prepared once a month, and by these means any falling off in thermal throughput or any rise in cost of production is detected and, if possible, rectified in the early stages.

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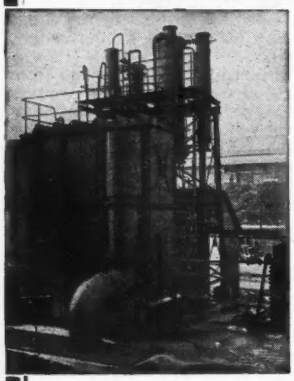

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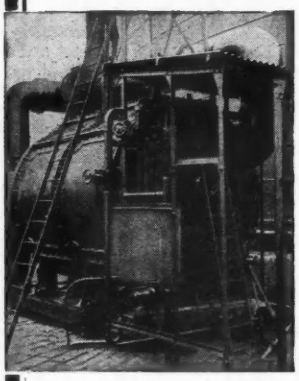

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Products Prices—Stocks and Shares

The London Market Aug. 9.

All Coal Tar Products are in good demand, and Pitch in the London area remains about 45s.

A new Order entitled The Control of Toluene (No. 3) Order, 1943 (S. R. & O. 1943, No. 976), came into force on July 20, and introduces certain changes in the prices for different grades of Toluene.

Apart from this there are no changes to report in Tar Products prices.

The Provinces Aug. 9.

The average prices of gas-works products during the week were: Pitch and Crude Tar,* Toluole, naked, North, 90's, 1s. 10d., pure, 2s. 5d. (controlled by the Control of Toluene No. 2 Order, July 3, 1941, which fixes the maximum price at which this material may be sold). Naphtha and Xylole controlled by the Coal Tar Naphtha and Xylole Order, 1943, dated May 31 (S. R. & O., 1943, No. 768), operative from June 1. Carbolic acid, 60's, naphthalene, and anthracene controlled by the Coal Tar Products Prices Order S. R. & O. 2509, dated Dec. 7, 1942, and operative from Jan. 1, 1943. Filtered heavy oil (min. gr. 1,080), 7½d. to 8d. Creosote oil has been generally controlled as to direction and price for some time past. Current value—fuel grades 5d. to 5¼d.; timber preservation and other purposes 4¾d. to 6d.

* In regard to pitch and crude tar prices we would ask readers to refer to the editorial note on p. 396 of the "JOURNAL" for Sept. 10, 1941.

Tar Products in Scotland Aug. 7.

Steady conditions prevail throughout. Refined tar controlled. Value is 4½d. per gallon *ex* Works, naked. Creosote oil: Specification oil, 6½d. to 7d.; low gravity, 7½d. to 7¾d.; neutral oil, 6d. to 6½d.; hydrogenation oil, 5⅞d. per gallon; all *ex* Works in bulk. Refined cresylic acid is active at 3s. 6d. to 4s. 6d. per gallon *ex* Works, naked, according to quality. Crude naphtha: 6½d. to 7d. per gallon. Solvent naphtha: Basic prices delivered in bulk, 90/180 grade 2s. 8d., and 90/190 Heavy naphtha, Unrectified, 1s. 10½d.; Rectified, 2s. 3d. per gallon. Pyridine: 90/160 grade, 13s., and 90/140 grade, 15s. per gallon.

In the Stock Markets, the week opened with industrials still in demand, although some irregularity set in towards the close with a consequent hardening tendency in the Funds.

Gas stocks and shares were prominent in the news last week on the Gas Light and Coke Company's interim dividend announcement of 1½% (1% was paid for the full year 1942). The market was more active than for some time past and it will be seen that a large number of issues improved in value—Gas Light units gaining 1s. 9d. A heavy turnover was recorded in South Metropolitan ordinary, which dropped on the announcement of no interim payment, but subsequently recovered to gain 4 points on the week.

The following quotations were changed during the week ending Thursday last:

OFFICIAL LIST

Alliance & Dublin Ord.	95—100	+2½
British Ord.	108—113	+1
Commercial Ord.	67—72	+1
Gas Consolidation "B" Ord.	19/—21/-	+1/6d.
Gas Light Units	19/3—20/3	+1/9d.
Ditto 3½ p.c. max.	77—82	+7
Ditto 4 p.c. Pref.	93—96	+1
Ditto 3 p.c. Deb.	84½—87½	+½
Imperial Continental	90—93	+2
South-Eastern Gas Corporation Ord.	20/6—21/6	+-/9d.
Ditto 4 p.c. Pref.	19/—20/-	—-/3d.
South Metropolitan Ord.	86—91	+4
Ditto 6 p.c. Pref.	127—132	+2
South Suburban Ord. (x.d.)	97—102	Aug. 3
Ditto 5 p.c. Pref. (x.d.)	107—112	"
Ditto 4 p.c. Pref. (x.d.)	88—93	"
Ditto 3½ p.c. Red. Pref. (x.d.)	90—95	"
Southampton Ord.	90—95	+3
Tottenham Ord. (x.d.)	106—111	Aug. 3
Ditto 5 p.c. Pref. (x.d.)	106—111	"
United Kingdom Gas Corporation Ord.	20/3—21/3	+-/3d.
Wandsworth Cons. (x.d.)	107—112	Aug. 3
Ditto 4 p.c. Pref. (x.d.)	91—96	"

PROVINCIAL EXCHANGES

Bath Cons.	102—105	+2
Bristol Ord.	114—116	+1½
Ditto 5 p.c. Deb.	115—119	+1
Hartlepool Ord.	88—90	+4
Long Eaton 5 p.c. Deb.	105—110	+5
Newcastle Units (x.d.)	23/3—23/9	Aug. 3
Ditto 4 p.c. Pref. (x.d.)	98—100	"

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